DEPARTMENT OF CIVIL ENGINEERING

TEAM C-HELIX

EXHIBITIONS

ORIGAMI EMERGENCY SHELTER

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ABSTRACT:

Be it a natural disaster or an unfortunate war, people are often displaced and lose their livelihood. In these harsh conditions, they ought to be boasted with full hope and optimism. And this could be achieved by rehabilitating them as soon as possible with something more tangible than plastic tents. Adopting origami emergency shelters (OES) is the solution. There is nothing to dispose off, and everything could be reused. They are easy to move, hence the distribution becomes more effective. OES is intended to be a small, inexpensive, and safe shelter. Before relief workers get on the scene, an OES will provide an immediate housing solution for individuals affected. It will also be a potential solution for roadside-dwellers and nomadic people like Gaddi tribes of Himachal Pradesh.







OBJECTIVES:

- Creating a prototype origami emergency shelter model for real-time use.
- Making the process efficient and sustainable to support the plight of displaced people.

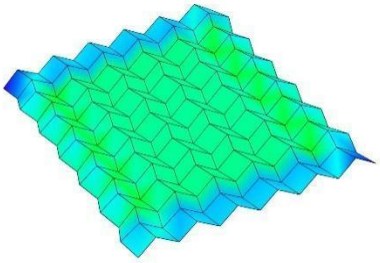




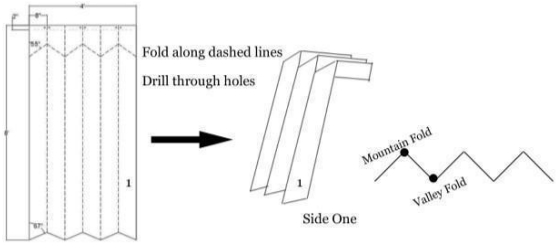


EXECUTION:

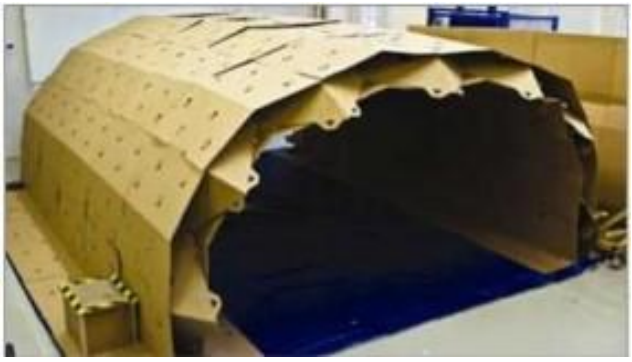
- Studying the techniques and applications associated with origami. An important property of origami folds is deployability – the ability to quickly assemble on-site and collapse for transport. From this perspective, the Miura-Ori fold is one of the best types.
- The seam joint simply connects two structures along a seam without overlap by adding additional material such as tape or fabric. The advantage of the seam joint is that it minimizes material waste.





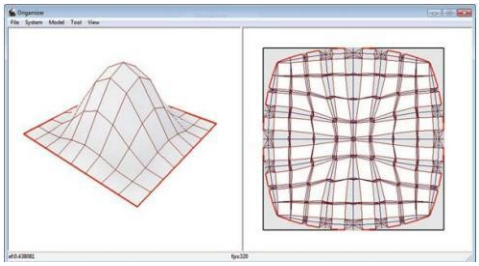


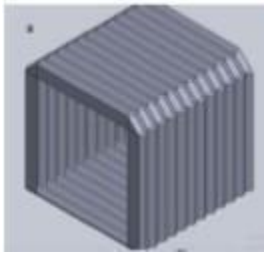
- This makes rigid-walled structures more suited towards permanent or semi-permanent housing and soft-walled structures more suited towards temporary shelters. Although origami can create complex structures, doing so with thicker materials becomes difficult because as the origami folding pattern increases in complexity the opportunities for misalignments increase. Therefore, simple folding techniques, such as the reverse fold, are best suited for this project.
- Incorporating additional 'smart' technologies and adaptations that increase the quality of life of a user is a priority. Solar technology, LED stakes, and lanterns for convenience at night. Another feature that would be useful is the ability to collect water for drinking other uses. Freestanding organizers could also be added.
- Corriboard, which is a form of corrugated plastic sheeting is waterproof, lightweight, and rigid. Allow users to manufacture, install, and maintain the origami shelters, and similarly build our origami shelter. Producing it at an industrial level would cost around 3-4Rs. /per square feet.





- To test several designs, use computer-aided design (CAD) models that could be closed on both ends and only featured simple reverse folds and seam joints. Based on the joint angle, the CAD model will be used to generate a mathematical model of the shelter design, which will calculate interior volume, dynamic heights, dynamic floor area, weight, dynamic length, percent elongation, and floor width using the material properties and basic shelter dimensions as inputs. Modeling will also be done in MATLAB and Solid Works.







- The model is used to optimize the shelter parameters so that the final shelter is adequately sized for an average person to stand in while maximizing usable interior space and minimizing both cost and weight. The interior volume will be chosen as the property to optimize and thus the parameters were adjusted to find the maximum interior volume while maintaining standing height on the longer of the two sides. It's important for the user to have an open interior space that is easily adaptable to their needs. Therefore, the design incorporates a locking mechanism, multiple built-in storage options, and a fire-resistant structure to allow for cooking within the shelter.







TENT	**ORIGAMI EMERGENCY SHELTER**
Very less resistance from external forces (wind, other peripherals).	Better resistance due to structural strength provided by origami technique.
Produce waste, after-use disposal has an ecological cost as it contains tin and other metals.	REUSEABLE, FOLDABLE, AND EASY TO TRANSPORT.
Polyester fabric is non-rigid.	Corrugated plastic is recyclable, fire and water-resistant, lightweight and rigid.
Other peripherals like poles are required.	NO NEED FOR ANY POLES OR SUPPORT MECHANISMS.
Good quality tent cost an upward of 3,000Rs. /person.	Whereas, OES cost only 2000Rs. /person.

LEARNING OUTCOMES:

- It helps us to gain insights into the old Japanese-art Origami which is a potential discipline in designing future-ready structures.
- As it develops a cushion to the unfortunate people. It helps us understand the social life of people and their priorities, altogether a new angle to our thought process.
- Having its core as sustainability, one gets to know about how the small things can contribute greatly to the cause.

SOCIAL BENEFITS:

- The changing climate patterns exacerbate social issues. Unusual and frequent disasters make social life suffer. Origami emergency shelters make a positive impact on them by maintaining social well-being. This will prevent them from experiencing depression, leading to an increase in their productive capacities, which will reduce their reliance on others.
- Nomadic people such as the Gaddi Herders of Himachal Pradesh or trekkers, as well as urban homeless, require highly portable lightweight shelters. It is perfect that the requirements of all of the potential users can be met by the benefits of an origami shelter.
- When war breaks out, people must leave their homes and livelihoods to adjust to unfavorable circumstances. As a result, crime rates increase due to inadequate security in refugee camps. Here is where our origami shelter can be very useful.

BUDGETARY REQUIREMENTS:

Material/Software required	Specifications	Quantity	Rate (Cost/quantity)	Total Cost
Origamizer	3D simulation			0
Solidworks/Blender	Modelling			0
MATLAB	Strength analysis			0
Ansys	Wind load analysis			
HOTGUN HOT MELT GLUE GUN 20W 20WATT 7MM WITH 10 TRANSPARENT GLUE GUN	For pasting	2	150	300
Cardboard		300	5	1500

Final Budget: Rs. 1800/-